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10/519,463	12/29/2004	Eiji Isono	P70333US0	2669

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WASHINGTON, DC 20004

EXAMINER	
SPAHN, GAY	
ART UNIT	PAPER NUMBER
3635	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/23/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/519,463	ISONO, EIJI	
	Examiner	Art Unit	
	Gay Ann Spahn	3635	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 August 2006 and 29 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-6* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 August 2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☒ Other: *Translation of JP 2003-049949*. (35 pages)

DETAILED ACTION

Response to Amendment

The amendment filed 29 November 2006 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

(1) page 5 of the clean copy of the substitute specification, lines 14-15, the sentence beginning "The inflection portion mentioned above is in a position in which the packing is bent or curved or twisted in the plane shape thereof, . . ." constitutes new matter because there is no support in the original disclosure for changing "crossed" to --twisted--.

Applicant is required to cancel the new matter in the reply to this Office Action.

Specification

The title of the invention is not descriptive. *A new title is required that is clearly indicative of the invention to which the claims are directed*.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 6 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 6, line 11-12, the recitation of "so as to provide isolated increased bonding areas of the packing in areas adjacent to the screw fixing portions" constitutes new matter as not being supported by the original disclosure.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1-3, lines 2-3, the recitation of "a packing to be firmly fixed to one surface of a plate in a predetermined arrangement" is vague, indefinite, and confusing because it is not understood if the change from a packing "is" firmly fixed to one surface of a plate in a predetermined arrangement to the language that a packing is "to be" firmly fixed to one surface of a plate in a predetermined arrangement is meant to recite intended use so that the gasket is being claimed per se instead of in combination with the plate and the opposing assembly member as the examiner previously interpreted

the claim language. Therefore, with respect to the merits, the examiner is taking the position that Applicant is now claiming the gasket per se.

Claim 1, lines 3-4, the recitation of "said plate being screwed to an opposing assembly member at a screw fixing portion" is vague, indefinite, and confusing because it is not understood if the change from the plate "is" screwed to an opposing assembly member at a screw fixing portion to the plate "being" screwed to an opposing assembly member at a screw fixing portion is meant to recite intended use and thus claim the gasket per se instead of in combination with the plate and the opposing assembly member as the examiner previously interpreted the claim language. Therefore, with respect to the merits, the examiner is taking the position that Applicant is now claiming the gasket per se.

Claims 1 and 2, lines 3-4 and lines 4-6, respectively, the recitation of "a lip portion of said packing being bent to one side in a width direction when said lip portion is compressed by said opposing assembly member" is vague, indefinite, and confusing because it is not understood if the change from the lip portion of the packing "is" s bent to one side in a width direction when said lip portion is compressed by said opposing assembly member to the lip portion of the packing "being" bent to one side in a width direction when said lip portion is compressed by said opposing assembly member is meant to recite intended use so that the gasket is being recited per se instead of in combination with the plate and the opposing assembly member as the examiner previously interpreted the claim language. Therefore, with respect to the merits, the examiner is taking the position that Applicant is now claiming the gasket per se.

Claim 1, lines 7-11, the recitation of "a packing extension portion partly enlarging an adhesive bonding area of said packing to said plate provided in a position close to said screw fixing portion, and at an inflection portion in a shape following that of said packing" is vague, indefinite, and confusing because:

(1) it is not understood how the packing extension portion (9) partly enlarges an adhesive bonding area of said packing (3) because it is the examiner's position that the packing extension portion either does enlarge the adhesive bonding area of the gasket (not the packing 3) or it does not;

(2) it is not understood where the packing extension portion is provided (i.e., is the claim reciting that the packing extension portion is provided simultaneously both at a position close to said screw fixing portion and at an inflection portion);

(3) it is not understood what constitutes "an inflection portion"; and

(4) it is not understood what is meant by "in a shape following that of said packing".

Claim 2, lines 7-9, the recitation of "a packing extension portion partly enlarging an adhesive bonding area of said packing to said plate provided at an inflection portion and at a position close thereto in a shape of said packing" is vague, indefinite, and confusing because:

(1) it is not understood how the packing extension portion (9) partly enlarges an adhesive bonding area of said packing (3) because it is the examiner's position that the packing extension portion either does enlarge the adhesive bonding area of the gasket (not the packing 3) or it does not;

(2) it is not understood where the packing extension portion is provided (i.e., is the claim reciting that the packing extension portion is provided simultaneously both at a position close to said screw fixing portion and at an inflection portion);

(3) it is not understood what constitutes "an inflection portion"; and

(4) it is not understood what is meant by "in a shape of said packing".

Claim 3, lines 4-6, the recitation of "a packing extension portion partly enlarging an adhesive bonding area of said packing to said plate provided in an inflection portion and at a position close thereto in a shape of said packing" is vague, indefinite, and confusing because:

(1) it is not understood how the packing extension portion (9) partly enlarges an adhesive bonding area of said packing (3) because it is the examiner's position that the packing extension portion either does enlarge the adhesive bonding area of the gasket (not the packing 3) or it does not;

(2) it is not understood where the packing extension portion is provided (i.e., is the claim reciting that the packing extension portion is provided simultaneously both at a position close to said screw fixing portion and at an inflection portion) and it is also not understood why "in an inflection portion" was not changed to --at an inflection portion" similarly to the changes made to claims 1 and 2;

(3) it is not understood what constitutes "an inflection portion"; and

(4) it is not understood what is meant by "in a shape of said packing".

Claim 4, lines 2-6, the recitation of "the packing is integrally formed in the plate, and remnants of a pouring hole arranged on the packing extension portion" is vague, indefinite, and confusing because:

(1) it is not understood what is meant by integrally formed (i.e., molded onto the plate or are the packing and packing extension portion integrally formed on the plate) and it is not understood how the packing could be integrally formed "in the plate" (i.e., perhaps it should be "on the plate"); and

(2) it is not understood what is meant by "remnants of a pouring hole arranged on the packing extension portion" (i.e., this is process language which is meaningless in a product claim and should be changed to recite that excess elastomeric material forms a protrusion on top of the packing extension portion 9 or similar).

Claim 6, line 11, the recitation of "isolated increased bonding areas of the packing in areas adjacent to the screw fixing portion" is vague, indefinite, and confusing as not being understood.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States

only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-6 are rejected under 35 U.S.C. 102(b) as being anticipated by JELINEK (U.S. Patent No. 4,254,960).

As to claim 1 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), JELINEK discloses a gasket (see Figs. 4-7) comprising:

a packing (35) to be firmly fixed to one surface (25) of a plate (11) in a predetermined arrangement, said plate (11) being screwed to an opposing assembly member (12 in Fig. 2),

a lip portion (36) said packing (35) being bent to one side in a width direction when said lip portion (36) is compressed by said opposing assembly member (12), and

a packing extension portion (portion beyond 42 including 40) partly enlarging an adhesive bonding area of said packing (35) to said plate (11) provided in a position close to said screw fixing portion, and at an inflection portion in a shape following that of said packing (35).

It is the examiner's position that JELINEK anticipates claim 1 since it now appears that the gasket is being claimed per se and thus, the plate with its screw fixing portions and the opposing assembly member are not being positively recited in combination with the gasket.

As to claim 2 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), JELINEK discloses a gasket (see Figs. 4-7) comprising:

a packing (35) to be firmly fixed to one surface (25) of a plate (11) in a predetermined arrangement, said plate (11) being screwed to an opposing assembly member (12 in Fig. 2) at a screw fixing portion,

a lip portion (36) said packing (35) being bent to one side in a width direction when said lip portion (36) is compressed by said opposing assembly member (12), and

a packing extension portion (portion beyond 42 including 40) partly enlarging an adhesive bonding area of said packing (35) provided at an inflection portion and at a position close thereto in a shape of said packing (35).

It is the examiner's position that JELINEK anticipates claim 2 since it now appears that the gasket is being claimed per se and thus, the plate with its screw fixing portions and the opposing assembly member are not being positively recited in combination with the gasket.

As to claim 3 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), JELINEK discloses a gasket (see Figs. 4-7) comprising:

a packing (35) to be firmly fixed to one surface (25) of a plate (11) in a predetermined arrangement, and

a packing extension portion (portion beyond 42 including 40) partly enlarging an adhesive bonding area to said plate (11) provided in an inflection portion and at a position close thereto in a shape of said packing (35).

It is the examiner's position that JELINEK anticipates claim 3 since it now appears that the gasket is being claimed per se and thus, the plate with its screw fixing

portions and the opposing assembly member are not being positively recited in combination with the gasket.

As to claim 4 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), JELINEK discloses the gasket of claim 1 as discussed above, and JELINEK also discloses that the packing (35) is integrally formed in the plate (11), and remnants of a pouring hole (40) arranged on the packing extension portion (portion beyond 42 including 40).

As to claim 5 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), JELINEK discloses the gasket of claim 1 as discussed above, and the packing (35) of JELINEK is capable of being used as a cover gasket for electronic equipment.

As to claim 6 (and as best understood despite the 35 USC 112, first and second paragraph, lack of written description and indefiniteness, respectively discussed above), JELINEK discloses a gasket (see Figs. 4-7) for electronic equipment (the gasket of JELINEK is capable of performing the intended use of being for electronic equipment), said gasket comprising:

a packing (35) to lie between a plate (11) and an opposing assembly member (12) and be compressed between the plate and the opposing assembly member (12 in Fig. 2), the plate (11) and the opposing assembly member (12) including screw fixing portions to secure the plate (11) and the opposing assembly member (12) together,

the packing (35) including a raised lip portion (36) and a side protruding base portion (below 41) extending along a periphery between the plate (11) and the opposing assembly member (12), and

the packing (35) further including an extension portion (portion beyond 42 including 40) on an opposite side of the raised lip portion (36) from the side protruding base portion (below 41) and positioned adjacent to the screw fixing portions so as to provide isolated increased bonding areas of the packing (35) in areas adjacent to the screw fixing portions.

It is the examiner's position that JELINEK anticipates claim 6 since the gasket is being claimed per se and not in combination with the plate having its screw fixing portions and the opposing assembly member.

Claims 1-6 are rejected under 35 U.S.C. 102(e) as being anticipated by SEKI ET AL. (U.S. Patent Application Publication No. 2005/0225039).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

As to claim 1 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), SEKI ET AL. disclose a gasket (1 in Fig. 11) comprising:

a packing (4/5) to be firmly fixed to one surface (7) of a plate (under 7 in Fig. 11) in a predetermined arrangement, said plate (base under 7 in Fig. 11; see paragraph no. [0055]) being screwed to an opposing assembly member (FPC; see paragraph no. [0055]) at a screw fixing portion,

a lip portion (5) said packing (4/5) being bent to one side in a width direction when said lip portion (5) is compressed by said opposing assembly member (FPC), and

a packing extension portion (2 in Fig. 11) partly enlarging an adhesive bonding area of said packing (4/5) to said plate (base under 7 in Fig. 11) provided in a position close to said screw fixing portion, and at an inflection portion in a shape following that of said packing (4/5).

It is the examiner's position that SEKI ET AL. anticipate claim 1 since it now appears that the gasket is being claimed per se and thus, the plate with its screw fixing portions and the opposing assembly member are not being positively recited in combination with the gasket.

As to claim 2 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), SEKI ET AL. disclose a gasket (1) comprising:

a packing (4/5) to be firmly fixed to one surface (7) of a plate (base under 7 in Fig. 11; see paragraph no. [0055]) in a predetermined arrangement, said plate (base

under 7 in Fig. 11) being screwed to an opposing assembly member (FPC; see paragraph no. [0055]) at a screw fixing portion,

a lip portion (5) said packing (4/5) being bent to one side in a width direction when said lip portion (5) is compressed by said opposing assembly member (FPC), and

a packing extension portion (under 11 in Fig. 11) partly enlarging an adhesive bonding area of said packing (4/5) provided at an inflection portion and at a position close thereto in a shape of said packing (4/5).

It is the examiner's position that SEKI ET AL. anticipate claim 2 since it now appears that the gasket is being claimed per se and thus, the plate with its screw fixing portions and the opposing assembly member are not being positively recited in combination with the gasket.

As to claim 3 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), SEKI ET AL. disclose a gasket (1) comprising:

a packing (4/5) to be firmly fixed to one surface (7) of a plate (base under 7 in Fig. 11; see paragraph no. [0055]) in a predetermined arrangement, and

a packing extension portion (under 11 in Fig. 11) partly enlarging an adhesive bonding area to said plate (base under 7 in Fig. 11) provided in an inflection portion and at a position close thereto in a shape of said packing (4/5).

It is the examiner's position that SEKI ET AL. anticipate claim 3 since it now appears that the gasket is being claimed per se and thus, the plate with its screw fixing

portions and the opposing assembly member are not being positively recited in combination with the gasket.

As to claim 4 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), SEKI ET AL. disclose the gasket of claim 1 as discussed above, and SEKI ET AL. also disclose that the packing (4/5) is integrally formed in the plate (base under 7 in Fig. 11), and remnants of a pouring hole (11) arranged on the packing extension portion (under 11 in Fig. 11).

As to claim 5 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), SEKI ET AL. disclose the gasket of claim 1 as discussed above, and SEKI ET AL. also disclose that the packing (4/5) is used as a cover gasket for electronic equipment (see HDD and FPC in paragraph no. [0074]).

As to claim 6 (and as best understood despite the 35 USC 112, first and second paragraph, lack of written description and indefiniteness, respectively discussed above), SEKI ET AL. disclose a gasket (1 in Fig. 11) for electronic equipment (hard disk drive or HDD; see paragraph no. [0074]), said gasket (1) comprising:

a packing (4/5) to lie between a plate (base under 7 in Fig. 11; see paragraph no. [0055]) and an opposing assembly member (FPC) and be compressed between the plate (base under 7 in Fig. 11) and the opposing assembly member (FPC), the plate (base under 7 in Fig. 11) and the opposing assembly member (FPC) including screw fixing portions to secure the plate (base under 7 in Fig. 11) and the opposing assembly member (FPC) together,

the packing (4/5) including a raised lip portion (5) and a side protruding base portion (4) extending along a periphery between the plate (base under 7 in Fig. 11) and the opposing assembly member (FPC), and

the packing (4/5) further including an extension portion (11 and under 11) on an opposite side of the raised lip portion (5) from the side protruding base portion (4) and positioned adjacent to the screw fixing portions so as to provide isolated increased bonding areas of the packing (4/5) in areas adjacent to the screw fixing portions.

It is the examiner's position that SEKI ET AL. anticipate claim 6 since the gasket is being claimed per se and not in combination with the plate having screw fixing portions and the opposing assembly member.

Claims 1-6 are rejected under 35 U.S.C. 102(e) as being anticipated by MIYAKE ET AL. (Japanese Patent Application Publication No. JP 2003-049949).

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

As to claim 1 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), MIYAKE ET AL. disclose a gasket (1 in Figs. 5-6) comprising:

a packing (1a/2) to be firmly fixed to one surface of a plate (4) in a predetermined arrangement, said plate (4) being screwed (see translation, last sentence of paragraph no. [0068] and paragraph no. [0113]) to an opposing assembly member (5 in Fig. 6) at a screw fixing portion,

a lip portion (2) said packing (1a/2) being bent to one side (Fig. 6) in a width direction when said lip portion (2) is compressed by said opposing assembly member (5), and

a packing extension portion (under 3) partly enlarging an adhesive bonding area of said packing (1a/2) to said plate (4) provided in a position close to said screw fixing portion, and at an inflection portion in a shape following that of said packing (1a/2).

It is the examiner's position that MIYAKE ET AL. anticipate claim 1 since it now appears that the gasket is being claimed per se and thus, the plate with its screw fixing portions and the opposing assembly member are not being positively recited in combination with the gasket.

As to claim 2 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), MIYAKE ET AL. disclose a gasket (1 in Figs. 5-6) comprising:

a packing (1a/2) to be firmly fixed to one surface of a plate (4) in a predetermined arrangement, said plate (4) being screwed (see translation, last sentence of paragraph no. [0068] and paragraph no. [0113]) to an opposing assembly member (5 in Fig. 6) at a screw fixing portion,

a lip portion (2) said packing (1a/2) being bent to one side (Fig. 6) in a width direction when said lip portion (2) is compressed by said opposing assembly member (5), and

a packing extension portion (under 3) partly enlarging an adhesive bonding area of said packing (1a/2) provided at an inflection portion and at a position close thereto in a shape of said packing (1a/2).

It is the examiner's position that MIYAKE ET AL. anticipate claim 2 since it now appears that the gasket is being claimed per se and thus, the plate with its screw fixing portions and the opposing assembly member are not being positively recited in combination with the gasket.

As to claim 3 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), MIYAKE ET AL. disclose a gasket (1 in Figs. 5-6) comprising:

a packing (1a/2) to be firmly fixed to one surface of a plate (4) in a predetermined arrangement, and

a packing extension portion (under 3) partly enlarging an adhesive bonding area to said plate (4) provided in an inflection portion and at a position close thereto in a shape of said packing (1a/2).

It is the examiner's position that MIYAKE ET AL. anticipate claim 3 since it now appears that the gasket is being claimed per se and thus, the plate with its screw fixing portions and the opposing assembly member are not being positively recited in combination with the gasket.

As to claim 4 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), MIYAKE ET AL. disclose the gasket of claim 1 as discussed above, and MIYAKE ET AL. also disclose that the packing (1a/2) is integrally formed in the plate (4), and remnants of a pouring hole (3) arranged on the packing extension portion (under 3).

Since the recitation of "remnants of a pouring hole" appears to be product-by-process language and since in product-by-process claims it is the product that is being claimed, the examiner deems the structure represented by reference numeral "3" to meet this claim language.

As to claim 5 (and as best understood despite the 35 USC 112, second paragraph, indefiniteness discussed above), MIYAKE ET AL. disclose the gasket of claim 1 as discussed above, and MIYAKE ET AL. also disclose that the packing (1a/2) is used as a cover gasket for electronic equipment (see translation, Technical Field of the Invention, paragraph no. [0001]).

As to claim 6 (and as best understood despite the 35 USC 112, first and second paragraph, lack of written description and indefiniteness, respectively discussed above), MIYAKE ET AL. disclose a gasket (1 in Figs. 5-6) for electronic equipment (hard disk drive or HDD; see translation, Field of the Invention, paragraph no. [0001]), said gasket (1 in Figs. 5-6) comprising:

a packing (1a/2) to lie between a plate (4) and an opposing assembly member (5) and be compressed between the plate (4) and the opposing assembly member (5), the plate (4) and the opposing assembly member (5) including screw fixing portions

(see translation, last sentence of paragraph no. [0068] and paragraph no. [0113]) to secure the plate (4) and the opposing assembly member (5) together,

the packing (1a/2) including a raised lip portion (2) and a side protruding base portion (left-most portion of 1a) extending along a periphery between the plate (4) and the opposing assembly member (5), and

the packing (1a/2) further including an extension portion (under 3) on an opposite side of the raised lip portion (2) from the side protruding base portion (left-most portion of 1a) and positioned adjacent to the screw fixing portions (see translation, last sentence of paragraph no. [0068] and paragraph no. [0113]) so as to provide isolated increased bonding areas of the packing (1a/2) in areas adjacent to the screw fixing portions.

It is the examiner's position that MIYAKE ET AL. anticipate claim 6 since the gasket is being claimed per se and not in combination with the plate having screw fixing portions and the opposing assembly member.

Response to Arguments

Applicant's arguments with respect to claims 1-5 and new claim 6 have been considered but are moot in view of the new ground of rejection.

The examiner notes that Applicant has amended the claims from reciting a gasket having a packing in combination with a plate and opposing assembly member, which plate and opposing assembly member are screwed together to a gasket per se by changing "a packing *is* firmly fixed to one surface of a plate *with* a predetermined plane

arrangement, said plate *is* screwed to an opposing assembly member *in* a screw fixing portion *at a time of assembling*" (emphasis added) to the intended use language of --a packing *to be* firmly fixed to one surface of a plate *in* a predetermined arrangement, said plate *being* screwed to an opposing assembly member *at* a screw fixing portion-- (emphasis added).

Thus, the examiner's rejections of the gasket per se based upon JELINEK (U.S. Patent No. 4,254,960), SEKI ET AL. (U.S. Patent Application Publication No. 2005/0225039), and MIYAKE ET AL. (Japanese Patent Application Publication No. JP 2003-049949) is considered to be necessitated by amendment.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gay Ann Spahn whose telephone number is (571)-272-7731. The examiner can normally be reached on Monday through Thursday, 8:30 am to 7:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl D. Friedman can be reached on (571)-272-6842. The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

GAS

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February 12, 2007

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Japanese Kokai Patent Application
No. P2003-49949A

GASKET

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GASKET

[Gasuketsuto]

Inventors:	Kuniaki Miyake, et al.
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[There are no amendments in this invention.]

Claims /2*

1. A gasket, which is a gasket that seals between 2 members, characterized in that it is equipped with a main bead part that projects out from a base part provided on one member towards the other member.

2. The gasket described in Claim 1 characterized in that

it satisfies $W1/W0 < 1.0$, where W0 is the adhesion width of the aforementioned base part adhered to the other member, and W1 is the width at a position half the height from the adhesion part of the aforementioned base part with one member to the front end part of the aforementioned main bead part,

the front end part of the aforementioned main bead part exceeds R=0.1 mm,

it satisfies $H/W0 \geq 0.8$, where H is the height from the adhesion part of the aforementioned base part with one member to the front end part of the aforementioned main bead part,

and the compressibility between the 2 members exceeds 20%.

3. The gasket described in Claim 1 or 2 characterized in that an adhesive is applied to one member beforehand, said member within applied adhesive is inserted and a gasket is molded, and the gasket is integrated with the other member.

4. The gasket described in Claim 1, 2, or 3 characterized in that the material of the gasket consists of a thermoplastic elastomer compound.

5. The gasket described in any one of Claims 1-4 characterized in that it is equipped with a sub-bead part that is lower in projection height than the aforementioned main bead part.

6. The gasket described in Claim 5 characterized in that the aforementioned main bead part projects out at an incline towards the aforementioned sub-bead part.

7. The gasket described in Claim 5 or 6 characterized in that the aforementioned sub-bead part is provided on the sealing target side of the aforementioned main bead part.

8. The gasket described in Claim 5, 6, or 7 characterized in that the resiliency generated when the gasket is compressed can be varied by adjusting the height of the aforementioned sub-bead part.

9. The gasket described in Claim 7 or 8 characterized in that a notch part is provided in one area of the aforementioned sub-bead part.

10. The gasket described in any one of the claims in Claims 1-9 characterized in that it is used as the top cover of a hard disk system.

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* [The numbers in the right margin indicate pagination of the original text.]

Detailed explanation of the invention

[0001]

Technical field of the invention

This invention concerns a gasket that seals between 2 members. For example, it concerns a gasket used as a seal in electronic devices including top covers of hard disk systems and fuel batteries, etc., particularly in the field of precision devices that must prevent the entrance of water content and dust and require outgassing performance.

[0002]

Prior art

With the combined miniaturization and increased performance of electronic devices in recent years, a reduction in the size and thickness of construction parts has been sought.

[0003]

However, poor assembly operability in manufacturing processes results when construction parts are made small. Therefore, the attainment of a variety of integrated and compound parts has been required. At the same time, improvements in the required characteristics (sealing performance, outgas performance, and quality) also have been sought.

[0004]

Conventional gaskets for electronic memory devices, for hard disk systems in particular, are attached in a structure that holds a single rubber construction and a foamed urethane sheet by a stainless steel and aluminum metallic cover, for example. The mounting operation is improved by integrating a rubber material (primarily fluoro rubber) to a stainless steel metallic cover, for example, and the adhesion between a rubber material and a metallic cover by an adhesive has been proposed in Japanese Kokoku Patent No. 2517797.

[0005]

However, in this adhering method using an adhesive, a gasket shaped rubber is molded by vulcanizing beforehand in a separate process, and it is afterwards adhered to a metallic cover by an adhesive. The manufacturing process is long and complicated. The vulcanizing process for manufacturing the gasket shape actually takes several minutes. The gasket after the vulcanization process is thin and easy to break and also easily adheres dust, etc. Therefore, it is required to wash the gasket several times and carefully adhere.

[0006]

On the other hand, a gasket material that consists of a styrene thermoplastic elastomer has been proposed in Japanese Kokoku Patent No. 2961068, and it discloses that the process can be simplified because it does not require vulcanization as compared to a rubber material and a reduction in cost is possible because the gasket material can be recycled.

[0007]

In this method, in which the gas material consists of a styrene thermoplastic elastomer, a gasket that is thin, soft, and easy to adhere must be pre-attached by some method, or the processability becomes very poor in an actual mounting operation.

[0008]

As a measure for this, a method has been used in which a member referred to as the frame part is inserted; a gasket consisting of a styrene thermoplastic elastomer is manufactured by injection molding beforehand, and then attached and integrated between a box part and a lid part of a hard disk system, for example. As a result, this requires a third member referred to as the frame part, thus increasing the number of parts.

[0009]

Through the attainment of high performance hard disk systems in recent years, there also is the tendency of the gasket being exposed to temperatures exceeding 100°C, and the performance of gaskets made of styrene thermoplastic elastomers has reached its limit.

[0010]

Japanese Kokoku Patent No. 2961068, as shown in Figure 11, discloses a gasket shape for displaying satisfactory performance in which the cross-sectional shape is rectangular and sandwiches the frame part and has a front end contacting part, which is the sealing face, in a linear (flat) form. When this shape is actually mounted as a product, the entire flat surface in /3
a cross-sectional linear form at the front end touches the other part (main part), and its resiliency is higher than that of the type that has a lip formed at the front end. A high resiliency is undesired because it results in a change in the shape of the lid (fixture), damage to the tightening screws in the mounting process, etc.

[0011]

Accordingly, for displaying a satisfactory performance using this gasket in a cross-sectional rectangular shape, it was necessary to lower the hardness of the gasket (stress)

and to design for a low resiliency. The actual preferred hardness in a gasket in a cross-sectional rectangular shape often has been less than 30 degrees (JIS durometer A). However, a method is used in which a large amount of a plasticizer component is mixed basically to lower the hardness of the gasket, which as a result undesirably increases the amount of outgassing. Furthermore, the tightening size also is not sufficient in this cross-sectional rectangular shape, and when main part has a delicate curvature, seal leaks easily occur.

[0012]

As the gasket shape for displaying a satisfactory performance, a bell shape in cross section also has been indicated in Japanese Kokoku Patent No. 2517797, as shown in Figure 12. This bell cross-sectional shape has a circular front end that contacts the main part, and the resiliency is somewhat low in the initial mounting, which makes the operation easy. However, as tightening is increased for a complete sealing, the same state from halfway results as indicated in Japanese Kokoku Patent No. 2961068, and the resiliency increases.

[0013]

Problem to be solved by the invention

The purpose of this invention is to offer a high performance gasket, with improved sealing performance, outgas performance, and quality.

[0014]

Means to solve the problem

To attain the aforementioned purpose, this invention is characterized in that a gasket that seals between 2 members is equipped with a main bead part that projects out from a base part provided on one member towards the other member.

[0015]

In this structure, the main bead part can be easily compressed, and the resiliency during mounting is low. Accordingly, the tightening size is sufficient, and the sealing performance improves. Also, it is not necessary to lower the hardness of the gasket or to mix a large amount of plasticizer component, and the outgas performance also improves. Furthermore, the shape of the two members does not change and the tightening screws do not impart damage, resulting in improved quality.

[0016]

With W0 being the adhesion width of the aforementioned base part adhered to the other member, and W1 being the width at a position half the height from the adhesion area of the aforementioned base part with one member to the front end area of the aforementioned main bead part, the gasket satisfies $W1/W0 < 1.0$,

the front end area of the aforementioned main bead part exceeds R=0.1 mm,

the gasket satisfies $H/W0 \geq 0.8$, where M is the height from the adhesion area of the aforementioned base part with one member to the front end area of the aforementioned main bead part, and the compressibility between the 2 members exceeds 20%.

[0017]

In this way, the main bead part can be easily compressed, and the resiliency during mounting can be made low.

[0018]

Preferably an adhesive is applied to one member beforehand, said member with applied adhesive is inserted and a gasket is molded, and the gasket is integrated with the other member.

[0019]

This allows for an easy manufacture and simplifies the manufacturing process.

[0020]

The gasket material preferably consists of a thermoplastic elastomer compound.

[0021]

This inhibits deterioration in performance and also improves quality even when the gasket is exposed to temperatures exceeding 100°C.

[0022]

The thermoplastic elastomer compound here containing styrene, for example, and the polymer is a triblock copolymer of styrene-ethylene/propylene-styrene (SEPS) or a triblock copolymer of styrene-ethylene/ethylene · propylene-styrene (SEEPS) as the main component, contains a polypropylene resin and a plasticizer, and has an adjusted hardness of 30-70 degrees (JIS durometer A).

[0023]

Also, the thermoplastic elastomer compound is a material formed by blending an olefin thermoplastic elastomer with a styrene thermoplastic elastomer. The structure of the olefin thermoplastic elastomer has an ethylene/propylene/nonconjugated diene ternary copolymerization rubber or ethylene/propylene copolymerization rubber, polypropylene resin, and a plasticizer as main components. The styrene thermoplastic elastomer has a triblock copolymer of styrene-ethylene/propylene styrene (SEPS) or a triblock copolymer of styrene-ethylene/ethylene propylene-styrene (SEEPS) as main components, contains a polypropylene resin and a plasticizer, and has an adjusted hardness of 10-70 degrees (JIS durometer A).

[0024]

It is desirably equipped with a sub-bead part that is lower in projection height than the aforementioned main bead part.

[0025]

This allows the main bead part to cover the sub-bead part when between 2 sealed members, which compresses the gasket. As a result, the compression resiliency of the gasket can be designed to be below the upper limit value, and the shape of the 2 members does not vary widely with a high resiliency that exceeds the upper limit value.

[0026]

The amount of gasket compression increases due to the increased contact surface when the main bead part covers the sub-bead part, and a satisfactory sealing performance will be displayed even if the height of the main bead part of the gasket and the distance between the 2 members during use varies or the amount of gasket compression varies. /4

[0027]

Furthermore, the minimal contact width when contacting the other member during use increases due to the increase in contact surface when the main bead part covers the sub-bead part, and the percentage of gas transmission can be reduced, although gas does not transmit at some percentage per unit length.

[0028]

The aforementioned main bead part preferably projects out at an incline towards the aforementioned sub-bead part.

[0029]

This allows the main bead part to easily cover the sub-bead part.

[0030]

The aforementioned sub-bead part is preferably provided on the seal target side of the aforementioned main bead part.

[0031]

This allows the main bead part that has covered the sub-bead part over the contact surface between the gasket and the other member to compress together with the sub-bead part, which increases the resiliency of the seal target side and displays a high bearing. A high bearing can be generated on the seal target side.

[0032]

It is desirable that the resiliency generated when the gasket is compressed can be adjusted by varying the height of the aforementioned sub-bead part.

[0033]

This allows adjustment of the resiliency when the gasket is compressed by varying the height of the sub-bead part, and an intended resiliency can be designed by varying the height of the sub-bead part.

[0034]

It is desirable that a notch part is formed in one area of the aforementioned sub-bead part.

[0035]

This allows introduction in the seal target of a fluid through the notch part between the main bead part that has covered the sub-bead part and the sub-bead part, and the pressure of the seal target fluid can directly interact with the main bead part, and the effect of furthermore increasing the bearing (self-sealing effect) can be strongly displayed by utilizing the pressure of the seal target fluid.

[0036]

It is desirable that it is used as the top cover of a hard disk system.

[0037]

Embodiments of the invention

Preferred embodiments of this invention will be explained in detail in examples while referring to the figures below. However, the size, material, shape, and their relative arrangements, etc., of the structural parts described in the embodiments do not intend to limit the scope of this invention only to them unless described specifically.

[0038]

(Embodiment 1)

Figure 1 is a diagram that indicates a gasket (1) in Embodiment 1. Figure 2 is a diagram that shows the gasket (1) in Figure 1 in the state it is used.

[0039]

The gasket (1) is provided over a top cover base material (4) and in a cross-sectional shape that has 1 main bead part (2) over the base part (1a). More precisely, the base part (1a) is adhered to the top cover base material (4), and the main bead part (2) that projects out towards a corresponding member (5) (the upper side in Figure 1) is provided over the base part (1a).

[0040]

Then, this gasket (1) satisfies the conditions (1)-(4) below.

[0041]

(1) $W1/W0 < 1.0$, where W0 is the adhesion width of the base part (1a) that adheres to the top cover base material (4), and W1 is the width at a position half the height H0 from the top cover base material (4) to the front end of the main bead part (2).

[0042]

(2) The front end area of the main bead part (2) exceeds R=0.1 mm.

[0043]

(3) $H0/W0 \geq 0.8$, where H0 is the height from the top cover base material (4) to the front end of the main bead part (2).

[0044]

(4) The compressibility when the gasket (1) is compressed between the top cover base material (4) and the corresponding member exceeds 20%.

[0045]

In order for the gasket (1) to satisfy the conditions above, the gasket (1) is injection molded by applying an adhesive to the top cover base material (4) beforehand and inserting the top cover base material (4) with said adhesive applied, and the gasket (1) is instantaneously integrated and provided to the top cover base material (4).

[0046]

Accordingly, the adhesion to the top cover base material (4) is obtained at the same time in the process of molding gasket (1), and the manufacturing process can be simplified.

[0047]

The gasket (1) here is formed of a material that consists of a thermoplastic elastomer compound.

[0048]

Specifically, the thermoplastic elastomer compound contains styrene. It is a polymer material with a triblock copolymer of styrene-ethylene/propylene-styrene (SEPS) or a triblock copolymer of styrene-ethylene/ethylene · propylene-styrene (SEEPS) as main components, contains a polypropylene resin and a plasticizer, and has an adjusted hardness of 30-70 degrees (JIS durometer A). The compressive permanent strain is adjusted to below 50% (JIS K6262 100°C, 72H).

[0049]

Or, the compound is an olefin thermoplastic elastomer blended with a styrene thermoplastic elastomer, for example. The olefin thermoplastic elastomer was an ethylene/propylene/nonconjugated diene ternary copolymerization rubber or ethylene/propylene copolymerization rubber, polypropylene resin, and a plasticizer as main components. The styrene thermoplastic elastomer is a polymer with a triblock copolymer of styrene-ethylene/propylene styrene (SEPS) or a triblock copolymer of styrene-ethylene/ethylene · propylene-styrene (SEEPS) as main components, contains a polypropylene resin and a plasticizer, and the compound has an adjusting hardness of 10-70 degrees, more desirably 20-50 degrees (JIS durometer A).

[0050] /5

The polymer of the styrene thermoplastic elastomer is a triblock copolymer of styrene-ethylene/propylene-styrene (SEPS) or a triblock copolymer of styrene-ethylene/ethylene · propylene-styrene (SEEPS). It is composed of a styrene polymer block that has a vinyl aromatic compound as the main part, isoprene polymer block that has a conjugated diene compound as the main part, random copolymer block of ethylene and isoprene, and a hydrogenated triblock copolymer that is obtained by hydrogenating a styrene polymer block that has a vinyl aromatic compound as the main part at the end terminal.

[0051]

It is desirable that the number-average molecular weight of these hydrogenated triblock copolymers is greater than 50,000. When the number-average molecular weight is less than 50,000, bleeding of the softening agent increases, which increases the compressive permanent strain; this may result in the drawback of not withstanding actual use. The upper limit of this number-average molecular weight is not limited in particular, but it is generally about 400,000.

[0052]

The content of amorphous styrene block in the aforementioned hydrogenated block copolymer is 10-70 wt%, preferably 15-60 wt%. The glass transition temperature of the amorphous styrene block (Tg) is also over 60°C, ideally over 80°C. A type of polymer that connects the amorphous styrene blocks at both end terminals that are amorphous is also desirable. These hydrogenated block copolymers are primarily used independently, however, 2 or more may also be blended and used.

[0053]

The olefin thermoplastic elastomer has an ethylene/propylene/nonconjugated diene ternary copolymerization rubber or ethylene/propylene copolymerization rubber, polypropylene resin, and a plasticizer as main components.

[0054]

The ethylene content is 50-80 wt%, and the iodine value is in the range of 10-25 in the ethylene/propylene/nonconjugated diene ternary copolymerization rubber. As the nonconjugated diene rubber, dicloropentadiene, 1,4-hexanediene, dichlorooctadiene, methylene norbornane, and ethylidene norbornane, for example, are used.

[0055]

The ethylene-propylene copolymerization rubber has an ethylene content of 10-25 wt% and a melt flow index (MFR) (JIS K7210 base, 230°C, 2.16 kg load) of 3-30 g/10 min.

[0056]

As the polypropylene resin, a thermoplastic resin that is obtained by polymerizing propylene in the presence of a catalyst, which is a crystalline polymer that has an isotactic and syndiotactic structure, for example, or a copolymer of this with a small amount of α-olefin (for example, ethylene, 1-butane, 1-hexane, and 4-methyl-1-petene, etc.) is used, and these desirably with a melt flow index (MFR) (JIS K7210 base, 230°C, 2.16 kg load) of 0.1-100 g/10 min and a degree of crystallization of 20-70%. The fluidity is poor when the MFR is less than 0.1, and the intended moldability cannot be obtained. A sufficient property cannot be obtained when the MFR is greater than 100.

[0057]

As the plasticizer, those that are used with regular rubbers and thermoplastic elastomers may be used including petroleum softening agents, such as process oil, lubricating oil, and paraffin oil, etc., fatty oil softening agents, such as castor oil, linseed oil, rapeseed oil, and coconut oil, etc., and ester plasticizers, such as dibutyl phthalate, dioctyl phthalate, dioctyl adipate, and dioctyl sebacate, for example. To this, a cross-linking agent, such as an organic peroxide, for example, cross-linking auxiliary, for example, may furthermore be added, or these necessary components may be mixed simultaneously, heat-fused, and kneaded for a dynamic cross-linking.

[0058]

As the composition of the gasket (1), scaly inorganic fillers that are generally mixed in rubber and thermoplastic elastomer, concretely clay, diatomaceous earth, talc, barium sulfate, calcium carbonate, magnesium carbonate, metallic oxide, mica, graphite, and aluminum hydroxide, for example, can be used. Solid fillers in powder form, such as various of metallic powders, glass powder, ceramic powder, granular or powder polymers, anticorrosive agent including amines and their derivatives, for example, imidazoles, phenols and their derivatives, and waxes, for example, may also be used.

[0059]

Various additives, such as stabilizers, tackifiers, mold releasing agents, pigments, flame retardant, and lubricants, for example, may also be added. For improving the abrasion and

moldability, for example, it is also possible to add a small amount of thermoplastic resin and rubber. Furthermore, for improving the strength and the rigidity, short fibers, for example, may also be added.

[0060]

These mixtures of the styrene thermoplastic elastomer and olefin thermoplastic elastomer can be easily manufactured by fusion-kneading them by using a heat-kneading machine, such as a uniaxial extruder, biaxial extruder, roll, banbury mixer, [Brabender], kneader, and a high shear mixer, for example, adding furthermore a cross-linking agent, such as an organic peroxide, for example, and a cross-linking auxiliary, for example, if intended, or simultaneously mixing and heat-fusion kneading these necessary components. It also can be manufactured by preparing a thermoplastic material that has a high molecular organic material kneaded together with a softening agent beforehand, and furthermore mixing this material together with 1 or more high molecular organic materials of the same kind used here or of different kinds.

[0061]

A compound that has a styrene thermoplastic elastomer and an olefin thermoplastic elastomer blended together that is obtained in this manner is molded into an intended shape by a conventional method, such as injection molding or extrusion molding, for example, and it can be used as the gasket material. Such a gasket material is suitably used in particular in hard disk systems that require a high dust prevention performance, and it also can be used as other regular gasket and packing materials in parts that require airtightness. /6

[0062]

Also, the adhesive that is applied between the top cover base materials (4) before molding the gasket (1) is based on a denatured olefin resin or a liquid based on styrene · butadiene rubber.

[0063]

Examples of concrete adhesives include polyolefin resins with polar groups (maleic anhydride, acrylic acid, epoxy group, and hydroxyl group, etc.) grafted on side chains and denatured then dissolved in an aromatic and fatty organic solvent and liquefied, or dispersed, or styrene · butadiene rubber that is dissolved in an organic and fatty solvent and liquefied alone or mixed together.

[0064]

As the method of applying the adhesive, a visual method is selected from soaking, spraying, screen printing, brushing, and stamping, etc., according to the need.

[0065]

As the top cover base material (4), metallic plates including aluminum plate and aluminum plate provided with a plating treatment, stainless steel plate, and stainless steel shake restricted plate, for example, may be used.

[0066]

The gasket (1) with the aforementioned structure, as shown in Figure 2, makes contact with the corresponding member (5) during use, in which there is distance S between the top cover base material (4) and the corresponding member (5), and seals between the top cover base material (4) and the corresponding member (5).

[0067]

During a seal between this top cover base material (4) and the corresponding member (5), the main bead part (2) will be primarily compressed and will change to the shape indicated in Figure 2.

[0068]

In this embodiment explained above, the main bead part (2) is easily compressed, and the resiliency during mounting is low. Accordingly, there is a sufficient tightening size, and the sealing performance is improved. It is also not necessary to reduce the hardness of the gasket (1), and it is not necessary to mix a large amount of plasticizer component, and the outgassing performance is improved. Furthermore, the top cover base material (4) and the corresponding member (5) do not change shape and the tightening screws do not impart damage, which improves quality.

[0069]

Evaluation test

For the evaluation of the effect of the aforementioned embodiment, embodiment examples structured within the established ranges of the aforementioned embodiment and comparative examples structured outside the established range are evaluated and compared. For the evaluation test, a variety of samples in Application Examples 1-9 and Comparative Examples 1-8 were prepared with the structures indicated in Figure 3, and the hardness, sealing

performance, outgassing performance, water transmission, adhesion, and the moldability, for example, were evaluated.

[0070]

'Sample preparation'

In this evaluation test, the styrene thermoplastic elastomer compound and the compound that has olefin thermoplastic elastomer blended with styrene thermoplastic elastomer are obtained by measuring mixtures in the specific amounts indicated in Figure 3 and mixing them together and extruding out by an biaxial extruder (manufactured by Kobe Seikosho K.K.: Hipar KTX46) under the conditions for the set temperature of 210-180°C and the rotational speed of 150 rpm.

[0071]

Using an injection molding machine (Kawaguchi Tekko K.K.: KM-80), this material is molded into a test sheet (150 x 150 x 2 mm) at the set temperature of 210-180°C, injection speed of 0.5 sec, injection pressure of 100 Mpa, and the cycle time of 30 sec, and used in testing the hardness, outgas performance, and the water transmission.

[0072]

A part that has an adhesive from the various kinds applied to an aluminum plate shaped into a cover shape beforehand (2-5 μm electroless nickel plating treated) is similarly inserted into a metallic mold, and the gasket is molded to the cover at the injection speed of 0.5 sec, injection pressure of 100 Mpa, and the cycle time of 30 sec. Using this cover integrated gasket, the sealing performance, adhesion, and the moldability are tested.

[0073]

The following thermoplastic elastomer compounds were used.

Polymer A (manufactured by Mitsui Chemistry K.K., Commercial name: Mirastomer 5030B (olefin)),

polymer B (manufactured by AES K.K., Commercial name: Santoprene 111-45 (olefin)),

polymer C (manufactured by Clare K.K., Commercial name: Septon 2006 (styrene : SEPS)),

polymer D (manufactured by Clare K.K., Commercial name: Septon 4055 (styrene : SEEPS)),

propylene resin (manufactured by Idemitsu Kosan K.K., Commercial name: J700GP), and a paraffin oil (manufactured by Idemitsu Kosan K.K., Commercial name: Diana process oil PW380) as the plasticizer.

[0074]

As the adhesive,

denatured olefin resin adhesive (manufactured by Mitsui Chemistry K.K., Commercial name: Unistol R120K),

and styrene · butadiene rubber adhesive (manufactured by Nogawa Chemical K.K., Commercial name: Diabond DA3188) are used.

[0075]

The cross-sectional shape of the gasket includes shapes A-E indicated in Figure 4. With shape A, W1/W0=0.5, the front end part of the main bead part (will be referred to as part Z below) is R=0.2 mm, and H0/W0=1.12. With shape B, W1/W0=0.74, R=0.25 mm in part Z, and H0/W0=1.12. With shape C, W1/W0=0.5, R=0.17 mm in part Z, and H0/W0=1.12. With shape D, W1/W0=1.0, there is no R in part Z, and H0/W0=0.8. With shape E, W1/W0=1/0, R=1.0 mm in part Z, and H0/W0=1.0.

[0076]

Concrete structures of various samples in Application Examples 1-9 and Comparative examples 1-8 manufactured from the selected elements above as indicated in Figure 3 are explained below.

[0077] /7

Application Example 1

The thermoplastic elastomer compound used includes polymer C: 100 parts by weight, polypropylene resin: 25 parts by weight, and plasticizer: 80 parts by weight. Denatured olefin resin adhesive is also used. Shape A is used as the gasket cross-sectional shape.

[0078]

Application Example 2

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used.

[0079]

Application Example 3

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 70 parts by weight and polymer C: 30 parts by weight and used..

[0080]

Application Example 4

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 30 parts by weight and polymer C: 70 parts by weight and used.

[0081]

Application Example 5

In Application Example 1, polymer C: 100 parts by weight is changed to polymer B: 50 parts by weight and polymer C: 50 parts by weight and used.

[0082]

Application Example 6

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer D: 50 parts by weight and used.

[0083]

Application Example 7

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Shape B is also used as the gasket cross-sectional shape.

[0084]

Application Example 8

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Shape C is also used as the gasket cross-sectional shape.

[0085]

Application Example 9

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Styrene · butadiene adhesive is also used instead of the denatured olefin resin adhesive.

[0086]

Comparative Example 1

In Application Example 1, shape D is used as the gasket cross-sectional shape.

[0087]

Comparative Example 2

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Shape D is also used as the gasket cross-sectional shape.

[0088]

Comparative Example 3

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Shape E is also used as the gasket cross-sectional shape.

[0089]

Comparative Example 4

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Plasticizer: 80 parts by weight is also reduced, and changed to plasticizer: 5 parts by weight and used.

[0090]

Comparative Example 5

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Plasticizer: 80 parts by weight is also reduced, and changed to plasticizer: 5 parts by weight and used. Shape B is used as the gasket cross-sectional shape.

[0091]

Comparative Example 6

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Plasticizer: 80 parts by weight is also increased, and changed to plasticizer: 150 parts by weight and used.

[0092]

Comparative Example 7

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Polypropylene resin: 25 parts by weight is also reduced, and changed to polypropylene resin: 5 parts by weight and used.

[0093]

Comparative Example 8

In Application Example 1, polymer C: 100 parts by weight is changed to polymer A: 50 parts by weight and polymer C: 50 parts by weight and used. Polypropylene resin: 25 parts by weight is also increased, and changed to polypropylene resin: 120 parts by weight and used.

[0094]

'Evaluation test'

In this evaluation test, the following evaluation is concretely obtained.

[0095]

(1) Hardness

3 test sheets at a thickness of 2 mm are laminated together and measured in accordance with JISK 6253.

[0096]

(2) Sealing performance (presence of leakage)

With the gasket integrally molded to the cover installed to an actual leak testing machine, a positive pressure of 5 kPa is continuously applied from the inside of the testing machine for 30 sec, and the occurrence of leakage after 15 sec is checked. When the compressive permanent strain of the gasket material is poor and the gasket shape is defected leakage occurs. In this test, it is evaluated as 'No leakage: 0, leakage: X'.

[0097]

(3) Sealing performance (resiliency)

The resiliency of the gasket integrally molded to the cover is measured. It is necessary to have an appropriate contact bearing for the obtainment of a seal. The bearing can be measured as the resiliency, and a sufficient seal cannot be obtained if the bearing is low and when the cover and corresponding member have irregularities. A high bearing also results in a change in shape of the cover. It is evaluated in the standards of 'desirable resiliency of 0.5-1.0 (N/mm): O, and others: X'. /8

[0098]

(4) Outgassing performance

A 50 x 3 x 2 mm test piece in a strip shape is heat-extracted at 120°C for 1 h, and the outgassing amount (μg/g) during it is measured. In this test, it is evaluated 'outgassing amount of less than 50 (μg/g): O, outgassing amount of over 50 (μg/g): X'.

[0099]

(5) Water transmission

10 cc distilled water is placed in a cylindrically shaped SUS container (inner diameter of 27 mm, and depth of 50 mm), a test piece adjusted to a diameter of 30 mm and a thickness of 1 mm is held, and attached by a hollow lid made of SUS (the inner diameter of the opening part of 27 mm). The steam transmission coefficient is obtained from the data at 70°C after 100 h ($g \cdot mm/cmm^2 24H$). In this test, it is evaluated 'steam transmission coefficient of less than $5x10^{-3}$ ($g \cdot mm/cmm^2 24H$): O, and steam transmission coefficient of over $5x10^{-3}$ ($g \cdot mm/cmm^2 24H$): X'.

[0100]

(6) Adhesion

A through peel at about 1 mm is formed on the gasket adhesion surface integrally formed to the cover, an SUS wire is passed through that site, a vertical pull load is applied, and the load when the peel length extends to about 10 mm is measured. In this test, it is evaluated 'the peel load of over 100 (kPa): O, and the peel load of less than 100 (kPa): X'.

[0101]

(7) Moldability

In the injection molding of the product, it is evaluated 'no problem: O, there is a problem: X'. Problem here means not molding into a specific product shape including the occurrence of

change in the shape, loss, chip, weld, short-short, and burr, and the occurrence of a phenomenon that does not allow the integral molding to the cover.

[0102]

When the hardness in 'the evaluation results' exceeds 70 degrees, the resiliency when the cover integrated gasket is attached to the main part becomes large, which causes the cover to change shape, etc., and not allow a complete seal, and deteriorates the sealing performance as the gasket. On the other hand, when it is less than 30 degrees, the outgassing increases. The gasket also easily breaks and adheres, etc., and it must be handled with caution. The most desirable hardness is between 40 to 60 degrees.

[0103]

On the other hand, for the obtainment of an intended moldability and hardness, the polypropylene resin and plasticizer must be used. However, the hardness becomes too high when the amount of the polypropylene resin is too large, the fluidity becomes poor when it is too small, which makes the injection formation difficult. The ideal polypropylene resin amount is 10-100 parts by weight for 100 parts by weight of the polymer. When the amount of plasticizer is similarly too large, it undesirably increases the amount of outgassing. The desirable amount of plasticizer is 10-200 parts by weight.

[0104]

When not using an adhesive, a peel occurs during molding, and integral molding is not possible. The integral molding is possible when using an epoxy and cyanoacrylate adhesive agent, but it easily peels off, and a sufficient adhesive strength cannot be obtained.

[0105]

Figure 3 shows the evaluation results of various of samples in concrete Application Examples 1-9 and Comparative examples 1-8 based on the evaluations below.

[0106]

As in the results explained above, the cover-integrated gasket that has an extremely excellent performance is established in the structures indicated in Application Examples 1-9. On the other hand, the structures indicated in Comparative examples 1-8 have some disadvantages.

[0107]

(Embodiment 2)

The satisfaction of the conditions below furthermore has been desired in the gasket of the above Embodiment 1.

[0108]

(1) The resiliency F that generates in the gasket when the gasket is compressed has a specific upper limit value so that the shape of top cover member or the corresponding member do not vary widely before establishing distance S between the top cover base material and the corresponding member, and the resiliency F has to be below the upper limit value.

[0109]

(2) The height H from the top cover base material to the gasket and distance S between the top cover base material and the corresponding member have practical differences, which as a result also generates a difference in the compression amount $\delta(\delta=H-S)$. Accordingly, it has been desired for the compression amount δ to be as large as possible for maintaining the sealing performance even if the compression amount δ varies.

[0110]

(3) The material used to construct the gasket transmits gas at some percentage per unit length. It has been necessary to maximize the minimal contact width for the gasket to make contact with the corresponding member during use for reducing the percentage of gas transmission.

[0111]

(4) The sealing performance of the gasket is better as a higher bearing is generated over the contact surface between the gasket and the corresponding member towards the seal target side I, and it has been desired to strongly display the effect for furthermore improving the bearing by utilizing the pressure of the seal target fluid in particular (self-seal effect).

[0112]

Accordingly, Embodiment 2 offers a high performance gasket that has a higher compression amount and minimum contact width than in the above Embodiment 1 for attempting to improve the sealing performance.

[0113]

Figure 5 is a diagram that shows gasket (1) of Embodiment 2. Figure 6 is a diagram that shows the gasket (1) in Figure 5 during use. The shape and the material, etc., of each member are the same as in Embodiment 1, and their explanations will be omitted.

[0114]

The gasket (1) in Figure 5 is provided over the top cover base material (4), and it has a cross-sectional shape that has 1 main bead part (2) and a sub-bead part (3), which is arranged at the seal target side I of the main bead part (2), over the base part (1a).

[0115]

The main bead part (2) is inclined towards the sub-bead part (3) so that the main part (2) easily covers the sub-bead part (3), and it projects out from the top cover base material (4) at height H1. /9

[0116]

The projection height of the sub-bead part (3) projects out lower than the main bead part (2). There is 1 sub-bead part (3) in this embodiment, but several may also be provided.

[0117]

These main bead part (2) and the sub-bead part (3) integrally project out over the base part (1a) towards the corresponding member (5) (upper side in Figure 5).

[0118]

The gasket (1) also uses a similar material as in Embodiment 1, however, rubber form elastomers including silicon rubber, EPDM, and fluoro rubber, for example, may also be additionally used. These materials allow the compressive shape change illustrated in Figure 6, and will also allow the possession of the elasticity that will generate resiliency at the time of compression.

[0119]

The gasket (1) in the aforementioned structure then makes contact with the corresponding member (5) and seals between the top cover base material (4) and the corresponding member (5) in the state of the use, in which distance S is established between the top cover base material (4) and the corresponding member (5), as indicated in Figure 6.

[0120]

In the attainment of a seal between this top cover base material (4) and the corresponding member (5), the main bead part (2) covers the sub-bead part (3), and has a state of the shape change indicated in Figure 6.

[0121]

The resiliency generated here in a state of shape change when the main bead part (2) covers the sub-bead part (3), has 2 stages, which include a low resiliency state until the main bead pat (2) makes contact with the sub-bead part (3) and a high resiliency state when the main bead part (2) makes contact with the sub-bead part (3) and is smashed and compressed together. In this invention, the height of the sub-bead part (3) is adjusted to have a high resiliency state in the state of the use (distance S is established between the top cover base material (4) and the corresponding member (5)), and the resiliency in that high resiliency state is set up to take a specific value G below the upper limit value.

[0122]

Accordingly, the resiliency due to the compression of the gasket (1) is designed to the specific value G in a high resiliency state and can be designed to be below the upper limit value similar to Embodiment 1, and the top cover base material (4) and the corresponding member (5) will not change their shapes abnormally by a large resiliency that exceeds the upper value.

[0123]

Figures 7 and 8 show the comparison results when the gasket (1) in this embodiment is compared to the gasket (1) in Embodiment 1 indicated in Figure 1 and 2. Here, the height H1 of the gasket (1) including the main bead part (2) in this embodiment is higher than height H0 of the gasket (1) in Embodiment 1, which has the relationship of $H1=1.2 \times H0$.

[0124]

Figure 7 indicates the relationship between the resiliency F and the compression amount. Figure 7(a) indicates the relationship between the compression amount of the gasket (1) and the resiliency in this embodiment. Figure 7(b) indicates the relationship between the compression amount of the gasket (1) and the resiliency in Embodiment 1.

[0125]

The resiliency F in the state of the use for both is set up to the specific value G, however, the compression amount is B1 for the gasket (1) in this embodiment and B0 for the gasket (1) in

Embodiment 1 respectively. Accordingly, the compression amount of the gasket (1) in this embodiment has the relationship of B1=1.5 x B0, which is greater than that of the prior art. This is because the main bead part (2) covers the sub-bead part (3), and the compression amount becomes larger than in the prior art by the increase in contact surface, and a satisfactory sealing performance will be displayed even if the height H1 of the main bead part (2) of the gasket (1) and the distance S during use vary and the amount of compression of the gasket (1) changes.

[0126]

Figure 8 also shows the relationship between the contacting width (minimal width) and the contacting bearing in the state of the use. Figure 8(a) indicates the relationship between the contacting width and the contacting bearing of the gasket (1) in this embodiment. Figure 8(b) indicates the relationship between the contacting width and the contacting bearing of the gasket (1) in Embodiment 1.

[0127]

The relationship between the contacting width (minimal width A1) of the gasket (1) in this embodiment during use and the contacting width (minimal width A0) of the gasket (1) in the prior art has the relationship of A1=2 x A0, and the contacting width (minimal width) becomes larger than in the prior art because the main bead part (2) covers the sub-bead part (3) and the contacting width (minimal width A1) increases due to the increase in contact surface. The percentage of the transmission of gas can be reduced because of a large contacting width although it transmits gas at some percentage per unit length.

[0128]

The contacting bearing of the gasket (1) in this embodiment has a peak at the seal target side I, as indicated in Figure 8(a), that improves the sealing performance because the main bead part (2), which has covered the sub-bead part (3) over the contact surface of the gasket (1) and the corresponding member (5), is in a state of a high resiliency that is compressed together with the sub-bead part (3), and the resiliency at the seal target side I becomes high and displays a high bearing.

[0129]

Third embodiment

Figure 9 is a diagram that shows gasket (1) of Embodiment 3. Figure 10 is a diagram that shows the gasket (1) in Figure 9 during use. The shape and the material, etc., of each member are the same as in Embodiments 1 and 2, and their explanations will be omitted.

[0130]

The gasket (1) in Figure 9 has a notch part (3a) formed in an area of the sub-bead part (3).

[0131]

As a result, the seal target fluid is introduced in through the notch part (3a) between the main bead part (2) that has covered the sub-bead part (3) and the sub-bead part (3) during use, and the pressure P of the seal target fluid directly interacts to the main bead part (2).

[0132]

Accordingly, the pressure P of the seal target fluid that pushes up the main bead part (2) interacts at the lower part of the main bead part (2) that has covered the sub-bead part (3), as indicated in Figure 10, with the gasket (1) in this embodiment, and the effect that furthermore increases the contacting bearing for the corresponding member (5) through the utilization of the pressure P of the seal target fluid (self-sealing effect) can be strongly displayed.

[0133]

Effect of the invention

As explained above, this invention has a main bead part that projects out from a base part provided on one member towards the other member. The main bead part is easily compressed, /10
and the resiliency during mounting is low. Accordingly, the tightening size is sufficient, and the sealing performance improved. It is not necessary to reduce the hardness of the gasket, and it is also not necessary to mix a large amount of plasticizer component, and the outgassing performance is improved. Furthermore, there is no change in shape of the 2 members and tightening screws do not impart damage, improving quality.

[0134]

With W0 being the adhesion width of the base part that adheres to one member, and W1 being the width at a position half the height from the adhesion part of the base part with one member to the front end part of the main bead part, $W1/W0 < 1.0$ is satisfied, the front end part of the main bead part is over R=0.1 mm. With H being the height from the adhesion part of the base part with one member to the front end part of the main bead part, $H/W0 \geq 0.8$ is satisfied. The compressibility between the 2 members exceeds 20%. The main bead part easily compresses, and the resiliency during mounting can be made low.

[0135]

The gasket can be easily manufactured, and the manufacturing process is simplified by applying an adhesive to one member beforehand, inserting one member that has the adhesive applied and molding the gasket, and providing the gasket integrally to the other member.

[0136]

The material of the gasket consists of a thermoplastic elastomer compound, and the performance does not deteriorate even if the gasket is exposed to temperatures exceeding 100°C. The quantity is improved.

[0137]

There is a sub-bead part that has a lower projection height than the main bead part provided, and the main bead part covers the sub-bead part when 2 members are sealed, and the gasket will be compressed. Accordingly, the resiliency by the compression of the gasket can be designed to be below the lower limit value as in the prior art, and the shape of the 2 members does not vary widely due to a high resiliency that exceeds the upper limit value.

[0138]

The gasket compression amount also becomes larger than in the prior art because the main bead part covers the sub-bead part due to an increase in contact surface, and it displays a satisfactory sealing performance even if there is a difference in the height of the main bead part of the gasket and in the distance between 2 members during use and the gasket compression amount changes.

[0139]

Furthermore, the minimal contacting width for making contact with the other member during use also increases due to an increase in the contact surface when the main bead part covers the sub-bead part, and the percentage of the transmission of gas can be reduced, although it transmits gas at some percentage per unit length.

[0140]

The main bead part easily covers the sub-bead part by inclining and projecting out from the main bead part towards the sub-bead part.

[0141]

The main bead part that has covered the sub-bead part over the contact surface between the gasket and other member is compressed together with the sub-bead part by arranging the sub-bead part at the seal target side of the main bead part, and the resiliency at the seal target side becomes high, and a high bearing is displayed, and a high bearing can be generated at the seal target side.

[0142]

It is possible to adjust the resiliency generated when the gasket is compressed by adjusting the height of the sub-bead part, which allows adjustment of the resiliency generated when the gasket is compressed by adjusting the height of the sub-bead part, and an intended resiliency can be set by adjusting the height of the sub-bead part.

[0143]

A seal target fluid can be introduced from the notch part between the main bead part that has covered the sub-bead part and the sub-bead part by providing a notch part in one area of the sub-bead part, and the pressure of the seal target fluid can directly interact with the main bead part, and the effect that furthermore increases the bearing through the utilization of the pressure of the seal target fluid (self-sealing effect) can be strongly displayed.

Brief description of the figures

Figure 1 is a cross-sectional diagram that indicates the gasket in Embodiment 1.

Figure 2 is a cross-sectional diagram of the gasket of Embodiment 1 in use.

Figure 3 is a diagram that indicates the evaluation results of the evaluation tests.

Figure 4 indicates cross-sectional diagrams that indicate the cross-sectional shapes of the samples used in the evaluation tests.

Figure 5 is a cross-sectional diagram that indicates the gasket of Embodiment 2.

Figure 6 is a cross-sectional diagram of the gasket of Embodiment 2 in use.

Figure 7 indicates diagrams that show the relationship between the compression amount and the resiliency.

Figure 8 indicates diagrams that show the relationship between the contacting width and the contacting bearing.

Figure 9 is a diagonally viewed cross-sectional diagram that indicates the gasket of Embodiment 3.

Figure 10 is a diagonally viewed cross-sectional diagram of the gasket of Embodiment 3 in use.

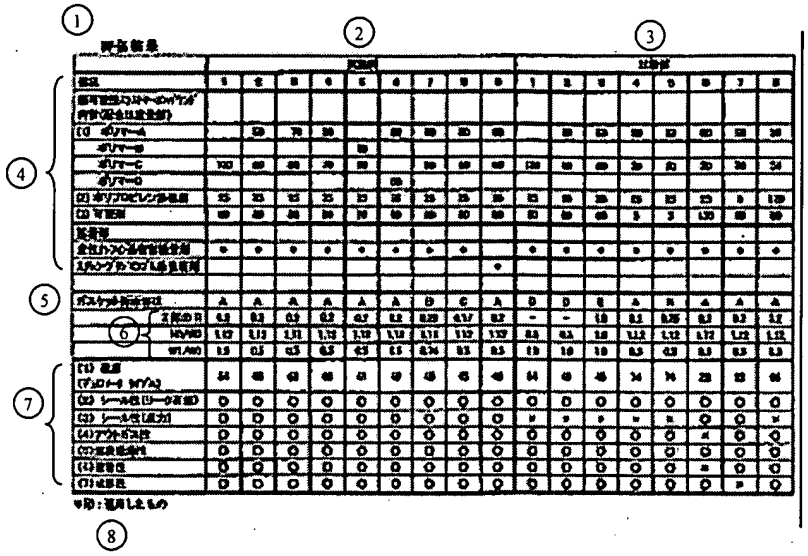

Figure 3

Key:
1 Evaluation results
2 Application examples
3 Comparative examples
4 Structure
Itemized thermoplastic elastomer compounds (mixing is in parts by weight)
Polymer A
Polymer B
Polymer C
Polymer D
Polypropylene resin
Plasticizer
Adhesive
Denatured olefin resin adhesive
Styrene · butylenes rubber adhesive
5 Cross-sectional shape of the gasket
6 R of part Z
7 Hardness (Durometer A)
Sealing performance (leakage)
Sealing performance (resiliency)
Outgassing performance
Water transmission
Adhesion
Moldability
8 *: Those that are applied

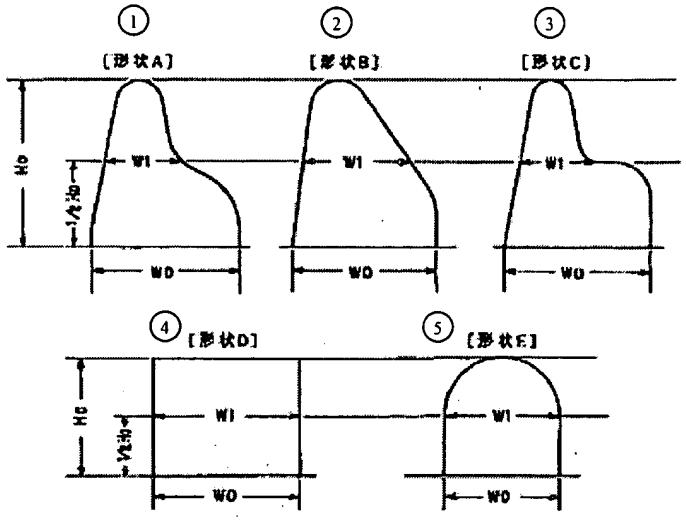

Figure 4

Key:
1 Shape A
2 Shape B
3 Shape C
4 Shape D
5 Shape E

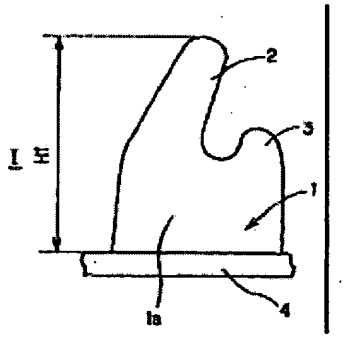

Figure 5

Figure 11 is a cross-sectional diagram that indicates a gasket of the prior art.

Figure 12 is a cross-sectional diagram that indicates a gasket of the prior art.

Explanation of the numbers

1 Gasket
1a Base part
2 Main bead part
3 Sub-bead part
3a Notch part
4 Top cover base material
5 Corresponding member

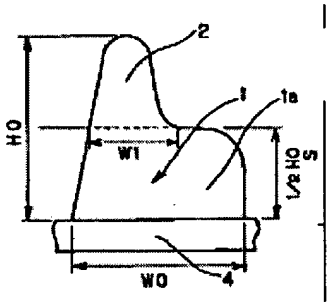

Figure 1

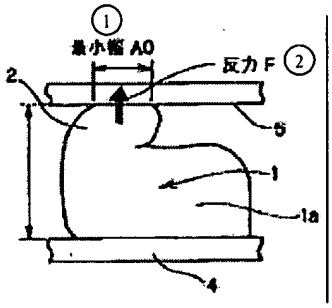

Figure 2

Key: 1 Minimal width A0
2 Resiliency F

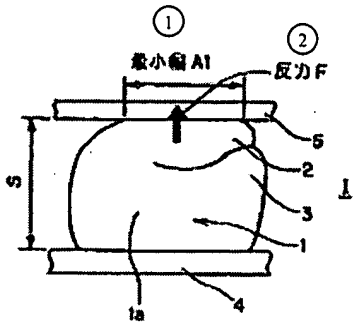

Figure 6

Key: 1 Minimal width A1
2 Resiliency F

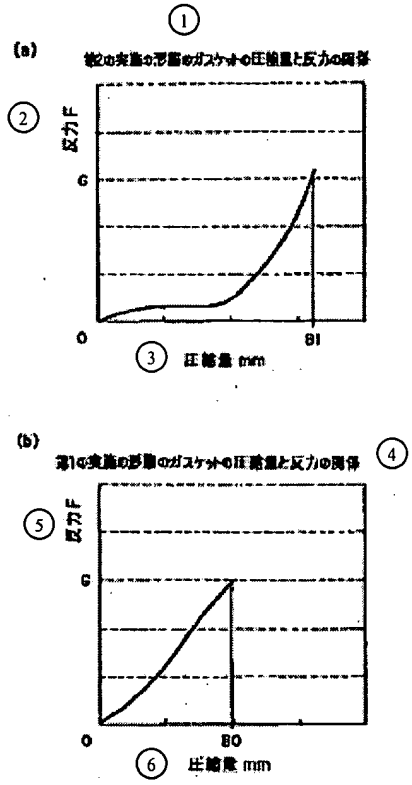

Figure 7(a) and (b)

Key: 1 Relationship between compression amount and resiliency of gasket of Embodiment 2
2 Resiliency F
3 Compression amount mm

4 Relationship between compression amount and resiliency of gasket of Embodiment 1
5 Resiliency F
6 Compression amount mm

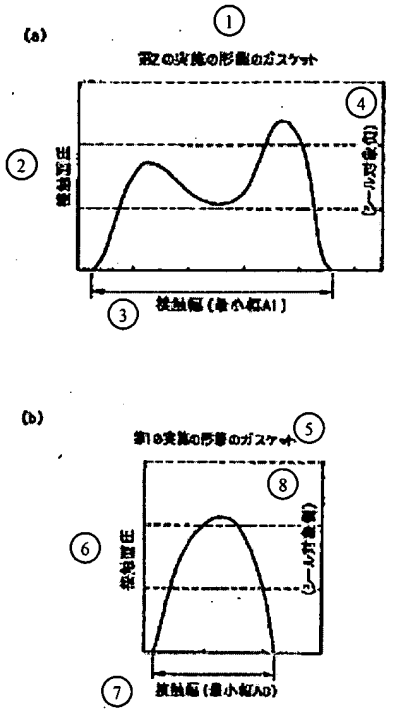

Figure 8(a) and (b)

Key: 1 Gasket of Embodiment 2
2 Contacting bearing
3 Contacting width (minimal width A1)
4 (Seal target side)
5 Gasket of Embodiment 1
6 Contacting bearing
7 Contacting width (minimal width A0)
8 (Seal target side)

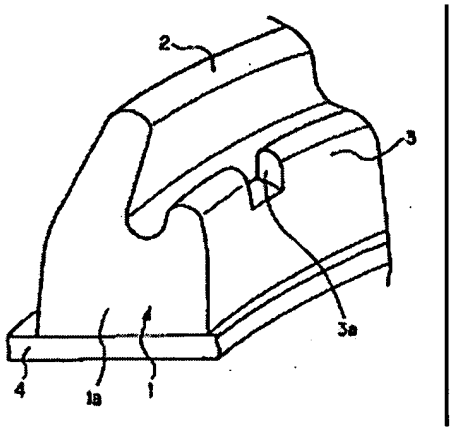

Figure 9

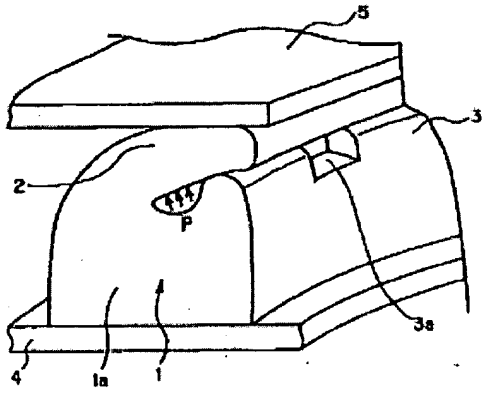

Figure 10

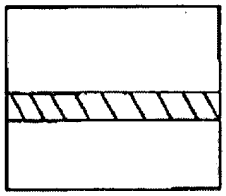

Figure 11

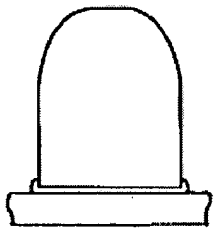

Figure 12